FIG. 7 is a flow chart depicting a method for generating a game of chance using a virtual gaming environment.

FIGs. 8 and 9 are perspective drawings of a 3-D interface for a gaming machine.

FIG. 10 is a flow chart depicting a method of playing a game on a gaming machine using a 3-D interface.

FIG. 11 is a flow chart depicting a method of displaying game information on a gaming machine.

12A-12F

FIGs. ~~12A-12E~~ are perspective drawings of screen input interfaces modeled in a 3-D gaming environment on a gaming machine.

FIG. 13 is a flow chart depicting a method of detecting input button collisions for input buttons modeled in a 3-D gaming environment on a gaming machine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a perspective drawing of a 3-D virtual gaming environment 100 implemented on a gaming machine for one embodiment of this invention. The 3-D virtual gaming environment may be used by the master gaming controller on the gaming machine to present a game of chance. The game of chance played on the gaming machine may include: 1) a wager selected by a player playing a game on the gaming machine, 2) an initiation of the game of chance on the gaming machine by the player, 3) a determination of an outcome for the game of chance by the gaming machine and 4) a presentation on the gaming machine of the game outcome to the player. In the present invention, the 3-D gaming environment may be used to present a game outcome to the player, describe operating functions of the gaming machine and provide an interface for obtaining gaming information and services. Apparatus and methods implementing these features are described with respect to FIGs. 1-12.

windows may be removed and the first game window may be returned to its original size.

An input location on a display screen of a gaming machine is often an important parameter for operating a gaming machine. The input location on the display screen may be used to determine whether an input button modeled on the display screen has been activated. The input location on a display screen may be determined from a cursor location on the display screen or an input to a touch screen on top of the display screen. The cursor may be moved by a mouse, touch pad or joystick on the gaming machine. Then, a input location of the cursor may be specified by using an input mechanism on the gaming machine. For instance, a user may hit an "enter button" on a mouse or a joy-stick.

In traditional gaming machines, the position of input buttons or input surfaces modeled on a display screen on the gaming machine are fixed. As described above, input buttons that may be used with a touch screen or a screen cursor and screen cursor controller may be modeled in a 3-D gaming environment. In the present invention, the position of these buttons on the display screen may vary as a function of time. For instance, the position of an input button or input surface modeled in a 3-D gaming environment may change on the display screen when a position of a virtual camera in the 3-D gaming environment is changed or an object in the 3-D gaming environment is moved. The position of the input buttons may change as a result of user input into the gaming machines or some other game event. For instance, the position of the button on the display screen may be change or an area occupied by the input button on the display screen may change as a view of the input button is changed. Thus, methods are needed to account for a change of position or size of an input button modeled on the display screen to determine when an input button has been activated. A few methods of accounting for input buttons with variable positions and sizes are described as follows with respect to FIGs. 12A-12E and FIGs. 13.

12A-12F

FIGs. ~~12A-12E~~ are perspective drawings of screen input interfaces modeled in a 3-D gaming environment on a gaming machine. In FIG. 12A, a game display 158 is on a surface 156 comprising a plurality of elements 152 modeled in a 3-D gaming environment with coordinate system 150. A 3-D dimensional input button 159 is also modeled in the game display 158. A virtual camera 154 is positioned in the game

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environment and used to render a photograph of the game display 158 with the input button 159. In FIG. 12 B, the rendered photograph 160 is displayed in game window 161 which may be displayed on a portion of a display screen on a gaming machine. The game window 161 has dimensions I by J which may correspond to a pixel length and a pixel width on the gaming machine. The game window 161 may be divided up into a 2-D grid of pixel locations. The input button 159 occupies a certain number of pixels on the game window 161.

In FIG. 12C, a screen input is detected at the screen location specified by the cross hairs 164. The screen input may be generated by a touch screen or some other input device on the gaming machine. In one embodiment of the present invention, the 2-D coordinates of the screen location and knowledge of the transformation used to render the 2-D view from the 3-D virtual gaming environment on the display screen may be used to generate a line in the 3-D gaming environment.

In Fig. 12D, an "input line" 165 is generated in the 3-D gaming environment from the 2-D coordinates of the screen location at 164 and a transformation used to render the 2-D view 166 in the game window 161 in FIG. 12C. The coordinates of the "input line" are checked to determine whether the input line intersects with an input button modeled in the 3-D gaming environment. In FIG. 12D, the line 165 intersects with input button 159. When the "collision" is detected, the gaming machine may determine whether the input button is "active." When the input button is active, the gaming machine may implement a gaming event specified by the input button. For instance, the gaming event may be to initiate a game on the gaming machine. When the input button is not active, the gaming machine may ignore the collision. When a non-rectangular coordinate system is used to model the 3-D gaming environment, the input line may not be straight and may be a curved line. Often the input line is referred to a as a ray and determining whether a collision has occurred is referred to as casting a ray.

After a collision has been detected on an "active" input button, the input button may be animated in some manner. For instance, the input button may be shown sinking into a surface from which it protrudes as if it were physically depressed. In Fig. 12~~D~~E, the input button 159 is shown in a depressed position in the 3-D gaming

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